

SUPERFUND CASHOUT USER'S MANUAL

Prepared for:

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**THIS MANUAL IS RELEASABLE IN ITS ENTIRETY
SUPERFUND CASHOUT USER'S MANUAL**

COMMENT FORM

The Office of Enforcement is very interested in your comments on the Superfund CASHOUT User's Manual. After you have had a chance to use the manual a few times, please fill out this comment form and return it to:

Jonathan Libber, LE-133
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401 M Street, S.W.
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If there are any significant errors in the manual, or it needs to be updated in some fashion, we will mail out revised pages to the names on our mailing list. Thus, it is important that you add your name to that list, if it is not already on it.

Superfund Cashout User's Manual

CHAPTER 1 - INTRODUCTION

	Excellent	Satisfactory	Poor	No Opinion
A. Clarity				
B. Usefulness				
C. Additional Comments:				

CHAPTER 2 - USING THE COMPUTER PROGRAM

	Excellent	Satisfactory	Poor	No Opinion
A. Clarity				
B. Usefulness				
C. Additional Comments:				

CHAPTER 3 - DATA REQUIREMENTS

	Excellent	Satisfactory	Poor	No Opinion
A. Clarity				
B. Usefulness				
C. Additional Comments:				

CHAPTER 4 - INTERPRETING OUTPUT AND CHANGING VARIABLE VALUES

	Excellent	Satisfactory	Poor	No Opinion
A. Clarity				
B. Usefulness				
C. Additional Comments:				

APPENDIX A

	Excellent	Satisfactory	Poor	No Opinion
A. Clarity				
B. Usefulness				
C. Additional Comments:				

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MAILING ADDRESS:

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() _____

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TABLE OF CONTENTS

INTRODUCTION	CHAPTER 1
A. OVERVIEW	1-1
B. PURPOSE OF SUPERFUND CASHOUT	1-3
C. HOW TO USE THE MANUAL	1-4
 USING THE COMPUTER PROGRAM	 CHAPTER 2
A. STRUCTURE OF THE PROGRAM	2-4
B. ENTERING THE DATA	2-6
1. Introduction	2-7
2. Format of the Data Entries	2-10
3. Correcting Typing Errors	2-11
4. Error Messages	2-12
a. Invalid Selection	2-13
b. Format Error	2-13
c. Illegal Character	2-14
C. ENDING PROCEDURES	2-15
 DATA REQUIREMENTS	 CHAPTER 3
A. REQUIRED VARIABLES	3-4
1. Superfund Site Name	3-4
2. Recurring Expenditures	3-5
a. Cost Data	3-5
b. Frequency of Cost Occurrence	3-7

TABLE OF CONTENTS (continued)

3.	One-Time Expenditure	3-8
4.	Annual Expenses	3-8
a.	Cost Data	3-8
b.	Duration of Annual Expense	3-9
5.	PRP Payment Date	3-9
6.	Superfund Site Cleanup Cost Commencement Date	3-10
B.	VARIABLES WITH STANDARD VALUES	3-11
1.	Inflation Rate	3-12
2.	Discount Rate	3-16
INTERPRETING OUTPUT AND CHANGING VARIABLE VALUES		CHAPTER 4
A.	OUTPUT OPTIONS	4-1
1.	Output Option 1	4-3
2.	Output Option 2	4-3
3.	Output Option 3	4-6
B.	CHANGING INPUT VALUES	4-6
1.	Changing Values in the Standard Value Mode	4-7
2.	Changing Values in the User-Specified Mode	4-9
METHODOLOGY FOR COMPUTING THE PRESENT VALUE OF SUPERFUND CLEANUP COSTS		Appendix A

TABLE OF CONTENTS
(continued)

**METHODOLOGY FOR COMPUTING THE
PRESENT VALUE OF SUPERFUND CLEANUP COSTS APPENDIX A**

I.	Introduction	A-1
II.	Underlying Assumptions	A-4
III.	Derivation of Mathematical Formulae	A-6
IV.	Sample CASHOUT Calculation	A-14

TABLE OF CONTENTS
(continued)

LIST OF EXHIBITS

1-1	Inputs for CASHOUT	1-3
2-1	Data Entry for CASHOUT	2-1
3-1	Effect of Variable Changes on Superfund CASHOUT Calculation	3-2
3-2	CASHOUT Data Entry Form	3-3
3-3	Standard Value Characteristics	3-12
3-4	<u>Chemical Engineering</u> Plant Cost Index, 1971-1991	3-15
4-1	Output Option 1	4-4
4-2	Output Option 2	4-5
A-1	Symbol Definitions	A-7
A-2	Sample CASHOUT Calculation - Output Option 2	A-17

A. OVERVIEW

The U.S. Environmental Protection Agency (EPA) developed the Superfund CASHOUT computer model to calculate the present value of the cleanup costs at Superfund sites that the government needs to collect from potentially responsible parties (PRPs). The CASHOUT computer model will assist EPA staff in developing settlement figures for Superfund *de minimis* settlements, commonly referred to as "cash outs."¹

De minimis settlements entail the early release from liability of certain contributors at a Superfund site after they pay their fair share of the total cleanup costs.² Thus, calculating the present value of cleanup costs using the CASHOUT computer model is generally the first step in "cashing out" PRPs involved in a *de minimis* settlement. The "present value" of future costs reflects the fact that a dollar today is different (i.e., worth more) than a dollar tomorrow. Cleanup costs to be incurred in the future need to be restated in terms of today's dollars to "cash out" PRPs. For a more detailed discussion of this concept, see Appendix A. Using the present value of the total cleanup costs, Agency staff can develop a basis from which they can estimate each *de minimis* contributor's share of the total cleanup costs.

¹ For a description of *de minimis* settlements, see CERCLA Section 122.

² *De minimis* PRPs are parties whose contribution, either the amount or toxicity of hazardous substances, are minimal in comparison to other hazardous substances at the site, or who are considered innocent landowners of the site (CERCLA §122(g)(1)).

The CASHOUT computer model is not intended for use at trial or in an administrative hearing. Rather, it should be used for developing estimates for PRP settlement negotiations or discussions. The model is available to the public upon request.

The CASHOUT User's Manual, contains all the information a user needs to run the model, as well as descriptions of the underlying formulae. This manual is designed to help you determine the appropriate input data for CASHOUT, to describe procedures for entering data, and to explain the program's results. This manual does not require that you have any formal training in economics or finance. Appendix A contains a detailed discussion of the economic rationale and the computational methods used in calculating the present value of cleanup costs. You do not have to be familiar with Appendix A to use CASHOUT or this manual.

CASHOUT calculates the present value of cleanup costs as of two dates: (1) the Superfund cleanup cost commencement date; and (2) the PRP contribution payment date (see Exhibit 1-1). Cleanup costs can include expenditures for pollution control equipment, one-time expenditures required to install or commence a cleanup (e.g., the cost of setting up a reporting system or stabilizing a site), and annual operating and maintenance costs.

CASHOUT can be used in all Superfund cases where there is a measurable cost of cleanup. CASHOUT is easy to use, and has been designed for people with no background in economics, financial analysis, or computers. Because the program contains standard values for some of the variables needed to calculate the present value of cleanup costs, CASHOUT can be run with only a small number of inputs. The program also provides the opportunity to use values other than the standard values. Exhibit 1-1 presents a listing of the inputs to CASHOUT. The standard values listed in Exhibit 1-1 (i.e., the inflation rate and the discount rate) are those which the user has the option of varying.

Exhibit 1-1
INPUTS FOR CASHOUT

<p><u>Required Inputs</u></p> <ol style="list-style-type: none">1) Superfund Site Name2) Recurring Expenditures3) One-Time Expenditure4) Annual Expenses5) Date of PRP Payment6) Date of Superfund Cleanup Cost Commencement <p><u>Standard Values³</u></p> <ol style="list-style-type: none">7) Annual Inflation Rate8) Discount Rate
--

B. PURPOSE OF SUPERFUND CASHOUT

The goal of the Superfund program is to clean up sites where hazardous substances have been, or might be, released into the environment. The Superfund program imposes liability upon PRPs for the cost of cleanup of sites. These costs may include:

- ! Response costs incurred by EPA;
- ! Response costs incurred by private persons;
- ! Natural resource damage claims; and
- ! Costs of health assessment or health effects studies.

Under Superfund, the government may either clean up a site and sue PRPs to recover cleanup costs, or require PRPs to undertake the cleanup themselves.

³ These are inputs which the user is not required to enter, but has the option of varying.

Some Superfund sites have hundreds of PRPs, making the enforcement process extremely cumbersome. *De minimis* settlements simplify the enforcement process by eliminating numerous minimal waste contributors from litigation and negotiations. Under these settlements, *de minimis* parties pay their fair share of the cleanup cost up front, and possibly a premium to cover future cost overruns and response actions, thus relieving themselves of future liability for cleanup. Additionally, these settlements help EPA obtain revenues earlier in the process to help finance the cleanup.⁴

C. HOW TO USE THE MANUAL

This manual provides instructions for using CASHOUT. These instructions illustrate a program run by using a hypothetical violator as an example, and taking you step-by-step through a CASHOUT run.

Chapter 2 describes how to use CASHOUT. Chapter 3 defines each of the inputs you will need to calculate the present value of cleanup costs. Chapter 4 describes the results and output from CASHOUT, and explains how to change input values for subsequent runs.

If you are already familiar with the program, you might only need to scan Exhibit 2-1 (in the introduction of Chapter 2) before proceeding. Help information is available in the program if you need a variable definition, guidance on information sources, or help with the format required for an input entry. To access help for a specific variable, type **HELP** or **H** after the prompt for that variable. After the explanation, CASHOUT will prompt you again for that same variable. If you need assistance in operating the program, understanding the results, or other guidance in using CASHOUT, contact the Program Development and Training Branch at 202-260-6777.

⁴ For a more detailed description of *de minimis* settlements, see U.S. Environmental Protection Agency, *De minimis Settlement Guidance Document*, June 1987.

CASHOUT is an interactive computer program designed to operate in time-sharing mode. This chapter is a detailed description of procedures for using CASHOUT to calculate the present value of Superfund site cleanup costs. For an in-depth description of each variable and recommended sources of information, see Chapter 3.

Chapter 2 is divided into three sections. Section A describes how the computer program is structured, and provides an overview of the choices that CASHOUT presents during program execution. Section B provides data format requirements and additional helpful hints for entering data at your computer terminal. This section also illustrates the error messages provided by CASHOUT if you fail to enter data properly. Section C explains the procedure for receiving a printed copy of the program output and for logging off of the computer when you finish your calculations.

Exhibit 2-1 is a printout illustrating the order and procedure for entering data. The inputs for the example are in **bold** print to distinguish user entries from the information and prompts provided by CASHOUT.

Exhibit 2-1

DATA ENTRY FOR CASHOUT

WELCOME TO CASHOUT.

WOULD YOU LIKE AN INTRODUCTION? (Y/N)

N

ENTER TODAY'S DATE (e.g., JUNE 1, 1992):

JULY 1, 1992

1. PLEASE ENTER THE SUPERFUND SITE NAME:

TEST SITE

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)= (FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)

(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

1000000 1992

HOW MANY YEARS BEFORE COSTS MUST BE INCURRED AGAIN?

(ENTER THE NUMBER OF YEARS BETWEEN COSTS; e.g., 15)

10

3. ONE-TIME EXPENDITURE=

(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)

(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

0

4. ANNUAL EXPENSE=

(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)

(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

25000 1992

HOW LONG WILL THE ANNUAL EXPENSES CONTINUE?

(ENTER THE NUMBER OF YEARS; ENTER 999 IF COSTS WILL CONTINUE "FOREVER")

10

5. MONTH AND YEAR WHEN PRP PAYMENT WILL BE RECEIVED (e.g., 6,1992)

1,1993

6. MONTH AND YEAR WHEN SUPERFUND CLEANUP COSTS COMMENCE (e.g., 12,1992)

1,1992

Exhibit 2-1

DATA ENTRY FOR CASHOUT (continued)

CASHOUT will use this information to estimate the present value of Superfund cleanup costs as of the cleanup cost commencement date, and the PRP payment date. If you select standard values for the remaining two variables (the inflation rate and the discount rate), these standard values will be printed in your output. You also have the option of entering your own values for these remaining two variables.

HOW DO YOU WISH TO TREAT REMAINING VARIABLES?
(1 = USE STANDARD VALUES, 2 = ENTER OWN VALUES)

2

YOU WILL NOW BE PROMPTED FOR VARIABLES 7 AND 8

7. ANNUAL INFLATION RATE (e.g., 2.0)=

3.2

8. DISCOUNT RATE: RATE OF RETURN ON FEDERAL FUNDS (e.g., 7.45)=

7.67

A. STRUCTURE OF THE PROGRAM

CASHOUT provides you with a number of choices for running the model. The first choice is whether to read an introduction to CASHOUT. This introduction explains what CASHOUT does, how it will prompt you for information, and the format for data inputs to the program.

A series of prompts for your input values follows the introductory question. You enter the requested information after each prompt. The present value of cleanup costs calculation involves a total of seven variables. The first input CASHOUT asks for is the Superfund site name. You then enter values for variables 2 through 6, which concern the costs of site cleanup and the dates for the PRP payment and cleanup cost commencement. CASHOUT then gives you a choice between entering site-specific data for the remaining two variables, 7 and 8, or using the standard values available in CASHOUT. If you choose to enter site-specific values, the program automatically prompts for these variables. When you are finished entering data, CASHOUT calculates the present value of cleanup costs for the Superfund site.

To access an explanation of the information required for a particular variable, simply type the word **HELP**, or the letter **H**, after the prompt for that variable. CASHOUT will print a few sentences which define the variable, give sources of information, and a brief reminder of the format required. After the complete help explanation has been listed, CASHOUT will prompt you again for the variable entry. You can then enter the required information.

When you have completed your inputs, you can then choose from one of three output options. The first two output options will list the CASHOUT calculation result, with different levels of detail. Both will display a list of your input values. The third output option lets you skip the output display altogether and return to the input section to change your data entries.

CASHOUT displays the results of your calculation on your terminal screen, and gives you the option of saving the output in a computer file for printing. When you are finished, you can choose to run the program again, or end the program session. If you run the program again, you can change one or more of your entries from the previous run. You can then recalculate the present value of cleanup costs without having to reenter all of your input values. These procedures are described in more detail in Chapter 4.

When you have finished the desired calculations and have ended a program session, CASHOUT will give you the opportunity to order a printed copy of your output. This output will include the results and the input values from all of the calculations in your session.

If you want to obtain a copy of your output and are at EPA Headquarters, you must indicate your bin number. You can then pick up your copy from your bin. If you do not already have one, you can obtain a bin and a bin number from the Washington Information Center (WIC) in the lower level of Waterside Mall (where the bins are located). The phone number for WIC is (FTS) 260-7200 or (202) 260-7200. The output will usually be delivered to your bin within an hour after you end your session. If you are not in Washington, your copy will be mailed to you at the address of record associated with your EPA computer user ID, after you indicate your mail box number. Your mail box number is simply your user identification number preceded by the letter M. You should receive your output in three to five days.

In addition, CASHOUT offers the following way of getting a printout of your CASHOUT results. Some users will find that this method is a faster and easier way to get a printout of their results: After you complete a CASHOUT session and exit from the program, you will reach the "READY" prompt. At this point, your CASHOUT results are stored in a file called "OUTPUT.CSH." Depending upon the configuration of your computer system and printer, you can either print the file directly, or download this file to a floppy (or hard) disk and then print the file.⁵ Contact your local computer specialist for the exact printing (or downloading) procedures at your location.

⁵ For example, if you are using a terminal that is hardwired to the mainframe, you can use the appropriate TSO print command to send your output directly to the printer. Alternatively, if you are "dialing up" the mainframe from a personal computer using a modem, you should download the file to a disk using your communications software. Once this file is downloaded to a disk, it can be printed directly from the operating system, or incorporated into a word processing package and printed.

Note that the file OUTPUT.CSH is overwritten each time that you save the output of a CASHOUT session. If you do several CASHOUT analyses, the file will contain the output from each run that you tell CASHOUT to save for printing. If you exit the CASHOUT model, and want a hard copy of your file, you must print (or rename) the file before starting the next run.

B. ENTERING THE DATA

CASHOUT is an interactive computer program. The terminal prints or displays a question and then waits for you to type an answer. The prompt for information will be either a description of the data to be entered or a question. In both cases, the cursor (or print head) returns to the beginning of the next line after printing each prompt.⁶

Be aware that there might be slight hesitations in the computer's response because of the time-sharing mode. Messages sent to and from the computer are interspersed with messages sent to and from other time-sharing users in your local area. A higher number of users puts a greater time demand on the transmission facilities because more terminals are sending messages over the same local telephone line. The incidence of many long hesitations indicates that there are more local users than usual using the time-sharing mode of the IBM computer. You will have to be patient in waiting for the entire prompt to be displayed before entering data.⁷

Also note that CASHOUT is different from most PC software programs (such as Lotus 123, or WordPerfect) in that its user interaction is linear, as opposed to page-oriented. This characteristic of CASHOUT means that you cannot move around the screen as you see it in order to edit an entry that you have already made.

The following sections illustrate some examples of user interaction with CASHOUT. The shaded boxes contain the screen displays for each example.

⁶ If you are using a TTY, you should wait until the entire prompt is printed and the print head has returned to the next line before entering data.

⁷ Another type of delay can occur if you have not used the program in the previous two weeks. In this case, the mainframe will need to pull information from archives, and you will be put "on hold" until this procedure is completed. The computer will let you know that this is occurring by giving you a prompt preceded by "ARC."

1. Introduction

WELCOME TO CASHOUT.

WOULD YOU LIKE AN INTRODUCTION? (Y/N)

Y

You need only type **Y** to represent yes, or **N** to represent no. However, CASHOUT will also recognize your answer if you type the full word for your response. If you answer **N**, CASHOUT will skip the introduction and take you to the next step in the program. In this example, the user has entered a **Y**, and you will see the introduction.

The introduction contains four video-screen size pages. To aid PC users in reading, CASHOUT pauses at the end of each page. Press the carriage return (or **enter** key) to read the next page. The introduction screens read as follows:

This program calculates the present value of cleanup costs for a given Superfund site. This calculation will give you a value that will allow you to "cashout" potentially responsible parties (PRPs) by having them pay their share of cleanup costs in one lump sum.

The Superfund CASHOUT calculation involves 8 variables. You must provide a name for the Superfund site and respond to five prompts for information about Superfund cleanup costs and certain dates involved in the case. CASHOUT then gives you a choice between providing values for the remaining two variables yourself or allowing CASHOUT to use standard values.

After each Superfund CASHOUT calculation, you can change some or all of the values you provide and perform another calculation without leaving the program.

Press the carriage return (or ENTER key) for the next page of text.

If you need additional information, call EPA headquarters:

FTS-260-6777 or 202-260-6777

Note also that a manual explaining CASHOUT in more detail is available by calling EPA headquarters.

CASHOUT allows only certain data formats for numerical values and dates: Numerical values (costs, rates, percentages, years) should be entered without commas, dollar signs, or percent signs. For example, enter a \$10,000 cost as 10000 and enter 20% as 20. Use decimals only for fractional values, such as 20.1 percent. Be careful to use only the number keys. Two common mistakes are typing the lowercase letter L instead of the number 1, or typing the capital letter O instead of the number 0. Dates entered for payment and cost commencement periods should be in numerical form, with the month separated from the year by a comma, as in: 6,1984. Note that the year must contain four digits.

Press the carriage return (or ENTER key) for the next page of text.

Shown below is one example of a data prompt, and a response in the correct format. Notice that CASHOUT gives you an example of the required format for data entry following the data prompt, enclosed in parentheses. Also note that the response (6,1992) begins at the left margin.

5. MONTH AND YEAR WHEN PRP PAYMENT WILL BE RECEIVED (e.g.,6,1992) 6,1992

You can obtain help when entering any of variables 1 through 8 by typing HELP, or simply the letter H, after CASHOUT prompts you for the variable. The help statements in CASHOUT include a definition of the variable, possible sources for related information, and the format required for entry. After providing the HELP explanation, CASHOUT will prompt you again for the same variable.

Press the carriage return (or ENTER key) for the next page of text.

Before you enter any of the input values for your first calculation, you enter today's date. CASHOUT prints this date and the Superfund site name at the top of the output for each calculation. This date may be entered in any format (e.g., Jun. 1, 1992; 6/1/92; 1 June 1992; and so on). The case name can be up to 40 characters long, including spaces.

You may leave the CASHOUT program without leaving the main computer system at any point during the input process. To do this, simply type "QUIT" (without quotation marks) in response to any prompt. CASHOUT will ask you if you are sure you want to "QUIT." If you answer "Y" (yes), CASHOUT will terminate and then give you the option of printing the previous output. The program will subsequently take you back to the operating system.

Press the carriage return (or ENTER key) when you are ready to begin.

2. Format of the Data Entries

CASHOUT data inputs require specific entry formats. Numerical values should be entered without commas, dollar signs, or percent signs. For example, a \$10,000 recurring expenditure in pollution control equipment is entered as **10000**. The same is true for all other cost inputs. Additionally, each cost entry must include the year in which the dollars are expressed. Throughout this manual and in CASHOUT itself, we refer to the year of the dollars in which a cost is expressed as the "dollar-year."⁸ The dollar-year must contain four digits. If you do not enter a year, CASHOUT assumes that costs are expressed as of the cleanup cost commencement year. Rates or percentages should be entered as a number without a percent symbol (e.g., enter **20** to represent 20 percent). Decimal numbers may only be used where fractional values occur, such as 20.1 percent.

Be careful to use only number keys to enter numerical values. A common mistake is typing the lowercase letter **L** instead of a number **1**. Another error occurs when the capital letter **O** is typed instead of the number **0** (zero).

Dates entered for compliance and payment periods must be in numerical form, with the month separated from the year by a comma (e.g., **6,1989**). The year must contain four digits.

An example of the required format for data entry follows each data prompt, enclosed in parentheses. If you do not follow the exact format, CASHOUT will print an explanatory error message and then re-prompt you for the correct entry. After your entry has been correctly typed, press the carriage return (or **enter** key) to transmit the data and signal to the computer that you are ready for the next prompt.

⁸ In calculating the present value, CASHOUT converts all dollar inputs (recurring expenditures, one-time expenditure and annual expenses) into dollars of the year of the cleanup cost commencement date. This dollar-year conversion is necessary to make the costs comparable.

3. Correcting Typing Errors

After typing your entry you might discover that you have typed an incorrect letter or number. If you have not yet pressed the carriage return (or **enter** key), correcting the mistake is straightforward. Simply press the **backspace** key for each character that you wish to delete, and type in the correct information. For example, if you had typed **10,234** and wanted to delete the comma, you would press the backspace key four times, type **234**, press the **space bar** once to delete the extra **4**, and then press the carriage return (or **enter** key). If you are using a PC, the cursor will erase each figure as you press the backspace key, and your corrected entry will appear on the screen. Since you corrected the mistake before hitting the carriage return (or **enter** key), the terminal sends 10234 to the computer, instead of the 10,234 entry that you originally typed.

If you discover the error after you have pressed the carriage return (or **enter** key), the terminal will send the incorrect entry to the computer. If your entry contains an unacceptable character, CASHOUT will print an error message and re-prompt you for a corrected input. CASHOUT will not detect an error if you simply enter an incorrect value. For instance, if you type **10244** instead of the intended value of **10234**, your calculation will be based on an erroneous input. In this case, after you have completed your data entry, CASHOUT will display your inputs and give you the option of changing any of the values that you entered, as displayed below.

USER SPECIFIED VALUES

1. SUPERFUND SITE NAME =	TEST SITE		
2. RECURRING EXPENDITURES EVERY 15 YEARS	= \$	10244	1992 DOLLARS
3. ONE-TIME EXPENDITURE	= \$	0	1992 DOLLARS
4. ANNUAL EXPENSE FOR 999 YEARS (FOREVER)	= \$	25	1992 DOLLARS
5. PRP PAYMENT DATE	=	1,	1993
6. SUPERFUND CLEANUP COSTS COMMENCEMENT DATE =		1,	1992

STANDARD VALUES

7. ANNUAL INFLATION RATE	=	2.00%	
8. DISCOUNT RATE	=	7.45%	

(DOLLARS IN THOUSANDS)

TYPE THE NUMBER OF VARIABLE TO BE CHANGED, OR TYPE 0 FOR NO CHANGE.

0

If you want to correct a mistake, enter the number of the variable you wish to change. CASHOUT will prompt you for a new value. See Chapter 4, Section B for more information on changing input values.

4. Error Messages

Occasionally, you might forget to follow the format rules when typing data entries, or you might select an option number that does not exist. In such instances, rather than continuing with the calculation, CASHOUT interrupts the regular prompting sequence to print an error message alerting you to the mistake. After displaying the error message, CASHOUT re-prompts you for the correct information for that variable.

Error messages can be general or variable-specific. General messages apply to all prompts. Variable-specific errors occur for a particular variable when CASHOUT checks for the correct relationships between variables, and for logical errors. Variable-specific messages are fully described in the case example which is covered in Chapter 3.

There are three types of mistakes that generate general error messages -- invalid selection of input values, format errors, and illegal characters. CASHOUT's error messages will help you locate the error, and allow you to re-enter the data before proceeding with your next input, or beginning the calculation. Each of these error messages is described below. Examples from CASHOUT sessions illustrate each error message, and its related correction procedure. User entries are shown in bold-face print.

The error-checking mechanism will not recognize the types of errors caused by mistyping; for example, a **3** instead of a **2**, misspelling the case name, or entering the wrong date in response to the "today's date" prompt. Therefore, you should write down each input before running CASHOUT, and then carefully check the typed data against each item on your written list. To do this, you can use the CASHOUT Data Entry Form (see Exhibit 3-2).

a. Invalid Selection

The first type of error involves choosing an option that was either not presented, or not in the allowable range. In the former case, CASHOUT simply re-prompts you for another value without printing an error message. In the latter case, CASHOUT prints a message telling you that your entry is not in the range of allowable values for that input.

For example, the choice between printing an introduction to CASHOUT or skipping over the introduction requires a yes (**Y**) or no (**N**) answer. In the following example, the user chose an option that was not presented and mistakenly typed **I** instead of typing the letter **Y** to signify yes.

```
WELCOME TO CASHOUT.  
WOULD YOU LIKE AN INTRODUCTION? (Y/N)  
I  
>>> ERROR: INVALID SELECTION. PLEASE REENTER. <<<  
WOULD YOU LIKE AN INTRODUCTION? (Y/N)  
Y
```

CASHOUT recognizes the error, prints an error message, and re-prompts the user for the correct information with the same question. The user then correctly typed **Y**, which is one of the available response options, and program execution continued as usual. The error message shown will appear whenever you respond with anything other than **Y** or **N** to the above question.

b. Format Error

The second type of general error message involves a format error. After each data prompt, CASHOUT provides an example of the format in which the data should be entered. These format examples are enclosed in parentheses. If you enter the data in an unacceptable format, an error message results. The user in the example below incorrectly typed commas in the cost input:

3. ONE-TIME EXPENDITURE=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
100,000

>>> ERROR: NUMERICAL VALUES SHOULD BE INPUT WITHOUT COMMAS.
(e.g., 10000 TO REPRESENT 10,000).
PLEASE REENTER. <<<

3. ONE-TIME EXPENDITURE=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

c. Illegal Character

The third general error message indicates that you have entered an illegal character. In this case, the user has typed a character that does not belong to the same alphanumeric category as the rest of the entry. For example, typing **\$10000** as a cost entry generates the error message because a dollar sign is not an acceptable numerical digit. Similarly, typing **20%** to enter "20 percent" is not acceptable because **20%** contains the nonnumeric percent sign. A very common mistake is to type the lowercase letter **L** instead of the number **1** when entering numeric values. CASHOUT gives you an error message as follows:

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
1000

>>> ERROR: AN ILLEGAL CHARACTER EXISTS IN THE ABOVE ENTRY. PLEASE
REENTER. <<<

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)= (FOLLOW
WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

Another common mistake is typing the capital letter **O** instead of the number **0** (zero) when entering numeric values. CASHOUT gives you an error message and then re-prompts for the correct information:

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

1000

>>> ERROR: AN ILLEGAL CHARACTER EXISTS IN THE ABOVE ENTRY. PLEASE
REENTER. <<<

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

The illegal character message occurs whenever the entry to any question contains a character that is nonnumeric in response to a prompt for a numeric value, including cases when a key might have been pressed by mistake, and a numeric entry suddenly contains an asterisk, bracket, quotation mark, or other non-alphanumeric symbol.

C. ENDING PROCEDURES

Once CASHOUT has completed a calculation and directed the output for printing, you can either end the session, or continue with further calculations. See Chapter 4 for an explanation of the procedures for changing variables and making additional calculations. If you have completed your CASHOUT calculations, typing **0** (zero) ends the session:

DO YOU WISH TO DO ANOTHER SUPERFUND CASHOUT CALCULATION?
(0=NO; 1=YES, USING STANDARD VALUES; 2=YES, USING OWN INPUTS)

0

DO YOU REALLY WANT TO LEAVE CASHOUT?
(0=NO, 1=YES)

1

All of your output has been saved in a file OUTPUT.CSH.
This file will be overwritten next time you run CASHOUT.
However, if you want to keep the file, you can rename it
by issuing the following DOS command:
REN OUTPUT.CSH ANYFILE.CSH,
where ANYFILE.CSH is the new name of the file.

After you type **0** (zero), and confirm termination by typing **1**, CASHOUT will notify you that output from all of the calculations in the session has been saved temporarily in a computer file, and that you have the opportunity to receive a printed hard copy. This point in the session is your only opportunity to request a copy of the output, and the output will be automatically deleted when you finish using CASHOUT. If you are using a PC that is not connected to a printer, you will probably want to receive a copy. If you want a printout from EPA's mainframe computer, simply respond to the prompt by typing **Y** to indicate yes:

Do you want the output to be printed (Y=yes, N=no)?

Y

CASHOUT then asks you for additional information. If you are in Washington, CASHOUT will ask you for your bin number:

PLEASE SUPPLY THE FOLLOWING INFORMATION:
ARE YOU WORKING AT A TERMINAL IN THE WASHINGTON D.C. AREA?
(Y=YES, N=NO)

Y

ENTER YOUR BIN NUMBER
(THE FORMAT SHOULD BE A LETTER D FOLLOWED BY
THREE NUMBERS. E.G., D099)

D099

You can obtain a bin (and number) at the Washington Information Center (WIC) in the lower level of Waterside Mall. The output will generally be delivered to your bin within half an hour. If you are outside Washington, CASHOUT will ask for your mailing box number:

ENTER YOUR MAILING BOX NUMBER
(THE FORMAT SHOULD BE YOUR USER IDENTIFICATION NUMBER
PRECEDED BY THE LETTER M, e.g. MXXX.)

MXXX

This number is your user identification number preceded by the letter M, e.g., MXXX. Your output will be mailed to you at the address recorded with your account information. You should receive your output in three to five days.⁹

CASHOUT will then notify you that your output will be printed and delivered or mailed:

YOUR OUTPUT WILL BE PRINTED AT THE COMPUTER CENTER AND
ROUTED TO YOUR BIN OR MAILED TO YOU.

You are out of the CASHOUT program when the computer returns you to the Legal Research Systems screen. You can then log off by selecting the exit choice (**L**) from the menu. You are then asked if you wish to stay on the computer. You answer **N** to be logged off. Turn off the terminal, modem, and printer, and the session is over. If you don't get the Legal Research Systems screen, you will instead get a **READY** prompt. You then log off the IBM System by typing **LOGOFF**, followed by a carriage return (or **enter** key). Turn off the terminal, modem, and printer, and the session is over.¹⁰

⁹ If you are using a TTY and already have a paper copy of the output, or if you are going to print the OUTPUT.CSH file to get a hard copy of your output simply type **N** for no when CASHOUT asks if you want to receive a printed copy. CASHOUT then ceases to ask you further questions, and returns you to the READY prompt or the Legal Research Systems screen.

¹⁰ If you fail to log yourself off, the mainframe will automatically do so for you, 15 to 20 minutes later. Note, however, that user charges will continue to accrue during this period. And, if you try to log back on during this period, the computer will inform you that your user ID is in use, and will not let you log on.

CASHOUT calculates the present value of Superfund cleanup costs including recurring expenditures, one-time expenditures, and annual costs. CASHOUT requires seven data items to calculate the present value of costs, in addition to the Superfund site name (see Exhibit 1-1 in Chapter 1). You must supply the site name and Variables 2 through 6. For the remaining two variables (the inflation rate and the discount rate), you can either use standard values or specify your own values. Standard values for these remaining two variables are contained in CASHOUT and should be used for your computation if you do not have data specific to the Superfund site. You should change a standard value only if you have reliable information substantiating the change. The present value calculation is performed in the same manner whether you use the standard values or specify your own values for variables 7 and 8.

The remainder of this chapter explains each of the variables, in the order in which you enter them in CASHOUT. Examples for a hypothetical "Test Site" accompany the explanation. The examples follow the prompting sequence, item by item, as it appears on your computer screen when you run CASHOUT. An example of a prompt and response follows each variable title, in a shaded box. The user's response is shown in **bold** print. The explanations include a brief description of the criteria you should use in developing the first six input values, and the basis for each of the standard values. Each explanation also contains a statement regarding how a change in the value of each variable will affect the CASHOUT present value result (e.g., increase it or decrease it). Exhibit 3-1 summarizes these effects by showing the direction of the change in present value caused by a change in each variable, holding all other variables constant.

Exhibit 3-1
EFFECT OF VARIABLE CHANGES ON
SUPERFUND CASHOUT CALCULATION¹⁰

Input #	Variable Name	Direction of Variable Change	Change in CASHOUT Result
1.	Site name	N.A.	N.A.
2.	Recurring Expenditures: Years Between Expenditures	Increase Increase	Increase Increase
3.	One-Time Expenditure	Increase	Increase
4.	Annual Expense Duration of Annual Expenses	Increase Increase	Increase Increase
5.	PRP Payment Date	Later	Varies
6.	Superfund Cleanup Cost Commencement Date	Later	Decrease
7.	Annual Inflation Rate	Increase	Increase
8.	Discount Rate	Increase	Decrease

To simplify your data entry, you might find it helpful to use the Data Entry Form presented in Exhibit 3-2. The form provides space for organizing multiple CASHOUT runs, thus allowing you to plan in advance which inputs you will want to vary. To facilitate future CASHOUT analyses, we suggest that you photocopy this page so that you will have a sufficient supply when the need arises.

¹⁰ Holding all other variables constant.

Exhibit 3-2

CASHOUT DATA ENTRY FORM

INPUT ITEM	RUN #1	RUN #2	RUN #3
1. Superfund Site Name			
2. Recurring Expenditures			
Dollar-Year			
Frequency of Occurrence (Years)			
3. One-Time Expenditure			
Dollar-Year			
4. Annual Expenses			
Dollar-Year			
Duration of Annual Expenses (Years, or 999 for "forever")			
5. Month, Year of PRP Payment Date			
6. Month, Year of CCC Date			
USE STANDARD VALUES? (Yes/No) If No, complete the following:			
7. Annual Inflation Rate			
8. Discount Rate			
CASHOUT RESULT			

Before you input your data items, CASHOUT asks you to enter the current data:

ENTER TODAY'S DATE (e.g., JUNE 1, 1992)

JULY 1, 1992

Any format may be used for the date. For example, CASHOUT accepts **7/1/92** just as easily as it does **July 1, 1992**. This date will be printed on each page of the results, for each calculation you make. You enter the date only once each time you use CASHOUT, even if you make present value estimates for several scenarios during a single session. If you use the program more than once during the same day, you can add the time of day after the date to differentiate between sessions. Be sure to press the carriage return (or **enter** key) after correctly typing your entry.

CASHOUT then begins prompting you to enter data specific to the Superfund site you are analyzing.

A. REQUIRED VARIABLES

1. Superfund Site Name

1. PLEASE ENTER THE SUPERFUND SITE NAME:

TEST SITE

After requesting the date, CASHOUT asks for the Superfund site name. This name can contain up to 40 characters, including spaces, and will appear along with the date on each page of the results. Since its sole purpose is for your own documentation, this label can contain anything you choose. The label can reflect the site's name; the name of a specific source, pollution control project, or environmental requirement; or a characteristic of the specific CASHOUT run (e.g., "Payment in July 1992"). If you are doing multiple runs for the same case, you might find it helpful to vary the case name for each run so that you can more easily distinguish among the

various runs. For example, you might title your runs "ABC Landfill: Ground Water Monitoring"; "ABC Landfill: Soil Removal"; and so forth.

If you enter nothing for the site name, nothing will be printed where the label normally appears on your results. Be sure to check for misspellings or incorrect dates before pressing the carriage return (or **enter** key), since CASHOUT will accept and print whatever you type for this label.

2. Recurring Expenditures

a. Cost Data

2. RECURRING EXPENDITURES FOR SUPERFUND CLEANUP (NOT ANNUAL COSTS)=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
1000000 1992

Enter the recurring expenditures without commas or dollar signs. The cost should be followed by a blank, and the year in which the dollars are expressed. Express the dollar-year in four digits. If you do not enter a dollar-year the first time through the program, CASHOUT assumes that the cost is in cleanup cost commencement year dollars. Enter a zero if there is no recurring expenditure.

There is an eight-character limit on cost amounts CASHOUT will accept. If your entry exceeds this limit, CASHOUT prints an error message and re-prompts you for a correct input:

ERROR: INPUT VALUE EXCEEDS THE 8-DIGIT LIMIT. PLEASE REENTER.

In the unlikely case that your costs are greater than \$99,999,999 dollars, you should give CASHOUT all of your costs divided by a factor of 1,000 and rounded to the nearest whole number. You can then multiply the CASHOUT result by 1,000 to determine the present value.¹¹

De minimis settlements can be made at various stages during the response process, although EPA encourages that they be reached as early as possible. As a result, cost information is available from a wide variety of sources, depending on the point in the response process at which settlement is discussed. In the past, *de minimis* settlements typically have been reached after the Feasibility Study is complete and the Record of Decision (ROD) has been published. Thus, cost information for most sites is available in the RODs. In cases where a *de minimis* settlement is reached before the Feasibility Study is completed, you can estimate cleanup costs from RODs of sites with similar characteristics.¹² Finally, if a *de minimis* settlement is reached after the Remedial Design is completed, you can find more accurate cleanup cost information in the detailed engineering studies completed for the site.

Cleanup costs, as generally reported in RODs, are separated into two categories: Capital costs; and operating and maintenance (O&M) costs. The capital cost of cleanup activities include one-time expenditures for equipment, labor, and materials necessary to install remedial actions. Capital costs also include indirect costs, such as expenditures for engineering, financial, and other services that are not part of the actual installation but are needed to complete the remedial action. Examples of actions requiring capital expenditures include the installation of thermal treatment systems, construction of water treatment plant and sewer lines, and the construction of slurry walls and caps.¹³

¹¹ This result will not be exact, but will be sufficiently precise given CASHOUT's rounding constraints.

¹² See U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Methodology for Early *De Minimis* Waste Contributor Settlements Under CERCLA Section 122(g)(1)(A), June 2, 1992.

¹³ U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988.

Capital costs can also include recurring expenditures, which are capital expenditures that must be made initially, and repeated in the future, as part of the ongoing remedial action. Examples of recurring expenditures include the replacement of groundwater pump and treat systems, or other treatment equipment with useful lives less than the length of the remedial action. If you have a specific source that will help you segregate the one-time and recurring capital expenditures (e.g., the Feasibility Study), you should use the data it provides to determine your recurring cost input.

In most cost estimates included in RODs, recurring expenditures are included in the total capital cost estimates. In these cases, you should use the total capital cost estimate as the one-time expenditure (input variable 3), and set Recurring Expenditures equal to zero.

You also must provide the dollar-year for the cost. If you do not provide a dollar-year, CASHOUT will assume that the costs are in cleanup cost commencement year dollars. If you have recurring expenditure costs with different dollar-years, you should do separate CASHOUT calculations for each.¹⁴ Holding all other inputs constant, the present value will be greater for larger capital investment outlays (See Exhibit 3-1).

b. Frequency of Cost Occurrence

HOW MANY YEARS BEFORE COSTS MUST BE INCURRED AGAIN?
(ENTER THE NUMBER OF YEARS BETWEEN COSTS; e.g., 15)
10

CASHOUT next asks you how frequently these costs will occur. Enter the number of years before the capital investment will be replaced. CASHOUT assumes that these replacements will continue forever. This value you enter is the "useful life" (in years) of the recurring expenditure. CASHOUT will not accept fractional values or a period greater than 50 years.

¹⁴ You can sum the separate CASHOUT calculations to determine total net present value, as long as your PRP payment date (Variable 5) is the same in each run.

3. One-Time Expenditures

3. ONE-TIME EXPENDITURE=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
0

Enter one-time expenditures followed by the appropriate dollar-year. Enter a zero if there is no one-time expenditure.

Your entry for this variable should include any one-time expenditures necessary to clean up the Superfund site. Such an expenditure could be for equipment, materials or labor needed to install remedial actions; or engineering, financial or other services that are purchased once as part of the cleanup. See input variable 2, Recurring Expenditures, for a discussion of data sources for the one-time expenditure.

CASHOUT assumes that any one-time expenditures will not be repeated in the future. As in the case of the recurring expenditure, CASHOUT will use the cleanup cost commencement year if you do not provide a dollar-year. The present value increases as the value for this variable increases because the PRP will pay a larger amount money in cleanup costs.

4. Annual Expenses

a. **Cost Data**

4. ANNUAL EXPENSE=
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
25000 1992

Enter any annual costs associated with the Superfund cleanup, followed by the year in which the dollars are expressed. Operating and maintenance costs associated with remedial actions are post-construction costs necessary to insure the continued effectiveness of the remedial action. Examples of such of O&M costs include operating labor costs, monitoring and sampling, repair and maintenance of caps and walls, and disposal costs.¹⁵ Remember that the annual expense is an estimate of the average annual cost of operating and/or maintaining the required environmental control measures to remediate and manage the site.

Enter a zero if there are no annual costs. If no dollar-year is entered the first time through the program, CASHOUT assumes that the costs are in cleanup cost commencement year dollars. The same format and eight character limitation apply to the annual expenditure as to the other cost inputs. CASHOUT will also ask for how long the annual expenses will continue.

b. Duration of Annual Expense

HOW LONG WILL THE ANNUAL EXPENSES CONTINUE?
(ENTER THE NUMBER OF YEARS; ENTER 999 IF COSTS WILL CONTINUE "FOREVER")
10

Enter the number of years for which the annual expense will occur. If the annual expense is expected to last forever, that is, for all useful lives of any recurring expenditures, enter **999**. Note that the program will only accept whole numbers.

5. PRP Payment Date

5. MONTH AND YEAR WHEN PRP PAYMENT WILL BE RECEIVED (e.g., 6,1992) **1,1993**

The PRP payment date is the date when the PRP will make its lump sum contribution to the Superfund

¹⁵ U.S. EPA, October 1988, *Op. Cit.*

site cleanup costs. Enter a month and a year, separated by a comma. The month is a number between 1 and 12, and cannot be omitted. The year must contain four digits (e.g., do not shorten the input to read **92** instead of **1992**). CASHOUT will not accept years before 1992 or after 2007. CASHOUT produces the following error message generated if the PRP payment year entered is inappropriate:

>>>PRP PAYMENT YEAR MUST BE BETWEEN 1992 AND 2007.<<<

If you vary the date of PRP payment (holding all other variables constant), CASHOUT automatically adjusts the present value as of the new PRP payment date, by discounting the costs to the revised date. The present value of cleanup costs will decrease as the period of time from the PRP payment date to the cleanup cost commencement date increases, assuming the PRP payment date occurs before the CCC date. If the CCC date occurs before the PRP payment date, the present value of cleanup costs will increase as the period of time between these two dates increase.

6. Superfund Site Cleanup Cost Commencement Date

6. MONTH AND YEAR WHEN SUPERFUND CLEANUP COSTS COMMENCE (e.g., 12,1992) **1,1992**

Enter the date when the Superfund site cleanup costs will commence. The format limitations that apply to the PRP payment date also apply to the cleanup cost commencement date. The CCC date may occur before or after the PRP payment date. CASHOUT will not accept CCC years before 1977 or after 2007. If an inappropriate CCC date is entered, CASHOUT generates the following error message:

>>>CLEANUP COST COMMENCEMENT YEAR MUST BE BETWEEN 1977 AND 2007.<<<

B. VARIABLES WITH STANDARD VALUES

CASHOUT requires seven user inputs (in addition to the site name) to calculate the present value of cleanup costs. At this point in the program you have already entered five of the inputs. CASHOUT offers two

options for supplying values for the remaining two variables. You can either use the standard values supplied by the program or provide your own values for these variables. At the beginning of the program, CASHOUT prints a short message outlining these options. CASHOUT then asks you to choose between using standard values and providing your own values:

CASHOUT will use this information to estimate the present value of Superfund cleanup costs as of the cleanup cost commencement date, and the PRP payment date. If you select standard values for the remaining two variables (the inflation rate and the discount rate), these standard values will be printed in your output. You also have the option of entering your own values for these remaining two variables.

HOW DO YOU WISH TO TREAT REMAINING VARIABLES?
(1 = USE STANDARD VALUES, 2 = ENTER OWN VALUES)

2

If you select the first choice, CASHOUT will assign standard values for the inflation rate and the discount rate. You need only to type **1** followed by a carriage return (or **enter** key), and CASHOUT will calculate the present value using these standard values.

The standard values in CASHOUT will be updated from year to year to reflect changes in inflation and interest rates, and so forth. While these values are updated, the assumptions upon which they are based remain the same. If the site you are analyzing is significantly different from that represented by the standard values, you might wish to specify values for some of the standard variables. In particularly complicated cases, you might also want to consult a financial analyst or an economist.

The standard variables are numbered 7 and 8. (Recall that variables 1 through 6 are the site name and the five inputs discussed in the previous section.) Exhibit 3-3 lists the assumptions that support the standard values.

If you want to enter your own values for Variables 7 and 8, type **2** followed by a carriage return (or **enter** key). CASHOUT then prompts you, beginning with Variable 7, for each nonstandard variable value. Note that CASHOUT displays the standard value for each of these variables in the format example contained in parentheses in the prompt.

Exhibit 3-3

STANDARD VALUE CHARACTERISTICS

Variable	Characteristic Assumed for Standard Value
8. Inflation Rate	The rate of increase in cleanup costs is equal to the average annual rate of increase in the <u>Chemical Engineering</u> Plant Cost Index over the most recent ten-year period.
9. Discount Rate	The discount rate is based on the expected rate of return for Federal funds. This rate is calculated taking the average return over the past five years.

1. Inflation Rate

7. ANNUAL INFLATION RATE (e.g., 2.0) =
3.2

Enter the inflation rate as a percent, followed by a carriage return (or **enter** key). Be certain that you enter an annual rate and not a monthly or semiannual rate.

The inflation rate variable in CASHOUT is the annual rate at which the costs of cleaning up Superfund sites have increased, and are expected to increase over time. These cost increases are the result of various factors affecting supply and demand for particular products and services, as well as general inflationary pressures in the economy. CASHOUT uses this rate to adjust the cost of site cleanup into the cleanup cost commencement-year costs. When the inflation rate is higher, the costs increase more quickly over time. An increase in the future cost

of cleanup costs increases the present value of cleanup costs.

The inflation rate standard value in CASHOUT is an average of inflationary trends over the last ten years, as reported by the "Plant Cost Index" (PCI) published in Chemical Engineering magazine.¹⁶ The Chemical Engineering Plant Cost Index is used rather than another index (e.g., the Consumer Price Index, or the GNP Implicit Price Deflator), because it more accurately reflects the costs of activities associated with pollution-control expenditures. The PCI is based on cost changes in typical components of pollution control, including equipment, construction labor, buildings, and engineering and supervision. Exhibit 3-4 presents the annual Plant Cost Index for 1971 through 1991. Over the ten-year period between 1981 and 1991, inflation related to plant costs averaged 2.0 percent.¹⁷

This value is reasonable for most CASHOUT calculations. If you have some reason to believe that a better inflation forecast for your purposes is available, contact EPA headquarters or an economist to discuss the

¹⁶ Chemical Engineering, McGraw Hill, Inc., biweekly issues. The Plant Cost Index is normally located on the page labeled "Economic Indicators."

¹⁷ In general, an annual inflation rate is calculated as follows:

$$\left[\left[\frac{\text{Index in final year}}{\text{Index in initial year}} \right]^{1/N} - 1 \right] \times 100$$

Where: N = Final year - Initial year

To obtain the standard value, the index values for 1991 and 1981 (361.3 and 297.0, respectively) were used to calculate the ten-year average. The calculation is:

$$\begin{aligned} & \left[\left[\frac{361.3}{297} \right]^{1/10} - 1 \right] \times 100 \\ &= (1.02 - 1) \times 100 \\ &= 2.0 \text{ percent} \end{aligned}$$

use of a nonstandard input.

Exhibit 3-4

**CHEMICAL ENGINEERING PLANT COST INDEX
1971-1991**

Year	Index
1971	132.2
1972	137.2
1973	144.1
1974	165.4
1975	182.4
1976	192.1
1977	204.1
1978	218.8
1979	238.7
1980	261.2
1981	297.0
1982	314.0
1983	316.9
1984	322.7
1985	325.3
1986	318.4
1987	323.8
1988	342.5
1989	355.4
1990	357.6
1991	361.3
Source: <u>Chemical Engineering</u> , McGraw Hill, Inc., biweekly issues, 1975-1992.	

2. Discount Rate

8. DISCOUNT RATE: RATE OF RETURN ON FEDERAL FUNDS (e.g., 7.45)=
7.67

Enter the discount rate as a percent followed by a carriage return (or **enter** key). Be certain that the discount rate is greater than the inflation rate. Otherwise, after all entries have been made, CASHOUT will flag the error with a message and then re-prompt you for both the inflation and discount rates. In the example below, the user entered an inflation rate of 9 percent and a discount rate of 7.5 percent:

7. ANNUAL INFLATION RATE (e.g., 2.0)=
9
8. DISCOUNT RATE: RATE OF RETURN ON FEDERAL FUNDS (e.g., 7.45)=
7.5
>>> ERROR: THE INFLATION RATE (9%) MUST BE LESS THAN THE DISCOUNT RATE (7.5%)
ENTER BOTH RATES AGAIN.<<<
7. ANNUAL INFLATION RATE (e.g., 2.0)=

To calculate the present value of cleanup costs as of the PRP payment date, CASHOUT uses the rate of return on Federal funds to discount the relevant cash flows. The standard value in CASHOUT is based on the average rate of return on Federal funds over the past five years.¹⁸ A higher discount rate increases the return, thereby decreasing the present value (See Exhibit 3-1). If you want to make any changes to the discount rate, it

¹⁸ As reported in Table 1.35 of the Federal Reserve Bulletin, 1987-1991, the historical yearly average Federal funds interest rates are:

1991	5.69%
1990	8.10%
1989	9.21%
1988	7.57%
1987	6.66%

The five-year average is 7.45%.

is strongly recommended that you consult EPA headquarters and/or an economist or financial analyst.

This chapter describes the output provided by CASHOUT and the procedures you can use to revise data inputs. The chapter is divided into two sections:

Section A describes the two levels of detail available for output. Output examples for both options are provided and explained.

Section B explains how to re-run the program by changing some or all of the variables. The different procedures for calculations using standard values and calculations using user-specified values are described. Also shown are error messages specific to changing standard and user-specified values.

A. **OUTPUT OPTIONS**

When CASHOUT has finished its calculations, it asks you how the output should be presented. The first time through the program, CASHOUT describes the three output choices in detail:

CASHOUT is ready to provide output. You have 3 choices:

1. Display only the present value of Superfund cleanup costs as of the PRP payment date. No intermediate calculations are displayed. All of the inputs used in the calculations are shown.
2. Display the present values of each cost component as of the Superfund cleanup cost commencement date and the PRP payment date. All of the inputs used in the calculations are shown.
3. Do not display results. Use this option if a data entry error is discovered.

CHOOSE OUTPUT OPTION 1, 2 OR 3.

All output options are designed to fit on standard letter-size paper, with top, bottom, and side margins on each page. For identification purposes, each page is marked with the date of the run (which you have entered) and the site name (input variable 1). All values are rounded to the nearest dollar for printing in the output tables.

When one or more of the expenditure inputs is a large dollar amount (i.e., any of the cost inputs exceed \$500,000), CASHOUT converts all dollar amounts to thousands. When this conversion occurs, CASHOUT provides a message alerting you that the results are in thousands of dollars. The message appears in parentheses under the present value calculation result in both output options.

In all of the output options, a listing of the variables used in the calculation follows the printout of the results, so that you may review your inputs along with your results.

Select one of the two output options by typing the number **1 or 2**; or skip over printing by choosing option **3**.

After you have finished all of your desired calculations, CASHOUT will provide you the option to receive a printed hard copy of the output, as described in Chapter 2. Alternatively, you can use your PC-based communications software to capture the output into a file, as described in Chapter 2. Consult with your local computer software specialist to proceed via this latter route.¹⁹

1. Output Option 1

Option 1 is the shorter form of output. Option 1 reports the present value of all cleanup costs and the variable values used in the calculation. The present value is expressed as of the PRP payment date. Exhibit 4-1 shows the output under Option 1. Note that the number of months of between the initial date of PRP payment and the CCC date is printed in a label next to the present value result.

2. Output Option 2

Option 2 prints the present value of each cleanup cost component as of two dates: the cleanup cost commencement date and the PRP payment date. Option 2 provides more information, and can help users understand the effect of changes in the inputs on the present value. Exhibit 4-2 shows an example of output Option 2.

¹⁹ If you are using a TTY, align the print head with the last line of the current sheet of computer paper. When you press the carriage return (or **enter** key), the output will start on a fresh blank page.

Exhibit 4-1

OUTPUT OPTION 1

TEST SITE			CASHOUT JULY 1, 1992
THE PRESENT VALUE OF SUPERFUND CLEANUP COSTS FOR SUPERFUND SITE AS OF PRP PAYMENT DATE, 12 MONTHS AFTER SUPERFUND COSTS COMMENCE			
	\$	3335	(DOLLARS IN THOUSANDS)
PLEASE PRESS CARRIAGE RETURN FOR MORE OUTPUT			
USER SPECIFIED VALUES			
1. SUPERFUND SITE NAME = TEST SITE			
2. RECURRING EXPENDITURES EVERY 10 YEARS	= \$	1000	1992 DOLLARS
3. ONE-TIME EXPENDITURE	= \$	0	1992 DOLLARS
4. ANNUAL EXPENSE FOR 10 YEARS	= \$	25	1992 DOLLARS
5. PRP PAYMENT DATE	=	1,	1993
6. SUPERFUND CLEANUP COSTS COMMENCEMENT DATE	=	1,	1992
7. ANNUAL INFLATION RATE	=		3.20%
8. DISCOUNT RATE	=		7.67%
			(DOLLARS IN THOUSANDS)
DO YOU WANT TO INCLUDE THESE RESULTS IN AN OUTPUT FILE FOR PRINTING?			

Exhibit 4-2

OUTPUT OPTION 2

TEST SITE

CASHOUT JULY 1, 1992

PRESENT VALUE OF CLEANUP COSTS AS OF COST COMMENCEMENT DATE:

RECURRING EXPENDITURES EVERY 10 YEARS		\$	2894
ONE-TIME EXPENDITURE		\$	0
ANNUAL EXPENSE FOR 10 YEARS	\$	204	
		=====	
TOTAL AS OF 1, 1992	\$	3097	

PRESENT VALUE OF CLEANUP COSTS AS OF PRP PAYMENT DATE:

RECURRING EXPENDITURES EVERY 10 YEARS		\$	3116
ONE-TIME EXPENDITURE		\$	0
ANNUAL EXPENSE FOR 10 YEARS	\$	219	
		=====	
TOTAL AS OF 1, 1993	\$	3335	

(DOLLARS IN THOUSANDS)

PLEASE PRESS CARRIAGE RETURN FOR MORE OUTPUT

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USER SPECIFIED VALUES

As illustrated in Exhibit 4-2, the top half of output Option 2 presents intermediate steps of the CASHOUT calculation, in addition to total present value of cleanup costs. The first set of figures shows the present value of the cleanup costs as of the Superfund cleanup cost commencement date. This figure is expressed in CCC-year dollars. The second set of results shows the present value of the cleanup costs displayed in Calculation A, discounted back to the date of the PRP payment, or when Superfund cleanup costs will be collected from the PRPs. This figure is expressed in PRP payment year dollars.

3. Output Option 3

Option 3 allows you to skip printing the output. You should use this option if you have discovered an error in your entry values. CASHOUT will then ask if you wish to make any further changes so that you can correct the error. Type **0** (zero) after you have made all necessary changes. CASHOUT then asks if you would like to see a listing of the current variable values to review your changes. If you answer **N**, for no, CASHOUT again lists the output options for your choice.

B. CHANGING INPUT VALUES

Once CASHOUT has completed a calculation and printed the output, you can end the session or conduct a second calculation. This section outlines the procedure for changing variable values after you complete your initial run. This feature allows you to recalculate the present value without having to re-enter all values. You might also wish to test the sensitivity of the present value calculation to changes in individual variables. (See Chapter 2, Section D above for an explanation of the procedure for ending all calculations.)

DO YOU WISH TO DO ANOTHER SUPERFUND CASHOUT CALCULATION? (0=NO; 1=YES, USING STANDARD VALUES; 2=YES; USING OWN INPUTS)

If you want to do another calculation, you must choose between a calculation using the standard values for variables 7 and 8, or a calculation in which you specify all inputs. Typing **1** indicates that you wish to use the standard values; typing **2** indicates that all values will be user-specified. Whenever you choose to use standard values, CASHOUT will prompt you for any changes to variables 1 through 6. The remaining variables will have the standard values. If you decide to use user-specified values, CASHOUT will prompt you for any changes to variables 1 through 8. CASHOUT then list the previous input values and prompts you for the variable(s) you wish to change.

CASHOUT allows you to change only certain variables when you re-run the program, depending on whether you used standard values in the previous calculation, and whether you plan to use standard values in the new calculation. Note that whenever you are planning a CASHOUT session involving multiple runs, it is helpful to fill out the Data Entry Form before you start (see Exhibit 3-2).

The next two subsections outline the procedures for changing variable values. The first subsection describes changing values in the standard value mode. The second subsection describes changing values in the user-specified mode.

1. Changing Values in the Standard Value Mode

DO YOU WISH TO DO ANOTHER SUPERFUND CASHOUT CALCULATION? (0=NO; 1=YES, USING STANDARD VALUES; 2=YES, USING OWN INPUTS) 1

This section outlines the procedures for changing variable values when CASHOUT assigns standard values to variables 7 and 8. Type **1** to indicate that you wish to use standard values.

CASHOUT will only allow you to change variables 1 through 6, since standard values will be used for the remaining variables. You can, however, change any or all of variables 1 through 6 one or more times during the change procedure. In the following example, the user wants to change variable 4.

TYPE THE NUMBER OF VARIABLE TO BE CHANGED, OR TYPE 0 FOR NO CHANGE.

4

CASHOUT responds with a prompt for the new variable value:

4. ANNUAL EXPENSE=

(FOLLOW WITH DOLLAR-YEAR SEPARATED BY A BLANK; e.g., 10000 1992)

(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

20000 1992

HOW LONG WILL THE ANNUAL EXPENSES CONTINUE?

ENTER THE NUMBER OF YEARS; ENTER 999 IF COSTS WILL CONTINUE "FOREVER")

999

Simply enter the new value according to the required format and press the carriage return (or **enter** key). CASHOUT will then list the current user-specified values, including any new values or changes. If you decide not to change the former value, simply press the carriage return (or **enter** key) without typing any other keys and CASHOUT will keep the former value in its memory. In the case of a cost and year entry, CASHOUT uses both former values. If you want to change a variable, and the prompt requires the dollar-year in addition to the cost entry, enter both values. If you omit the dollar-year entry and enter only the cost, CASHOUT will use the former value for the dollar-year, which is displayed with the former cost value.

If you attempt to change variables 7 or 8, CASHOUT will print the following message:

>>> ERROR: INVALID SELECTION. PLEASE REENTER. <<<

When you have made all of your changes, type **0** (zero). CASHOUT then will bring you to the output option menu. CASHOUT prompts you to select the output format from the following choices:

CASHOUT is ready to provide output. You have 3 choices:

1. Display only the present value of Superfund cleanup costs as of the PRP payment date. No intermediate calculations are displayed. All of the inputs used in the calculations are shown.
2. Display the present values of each cost component as of the Superfund cleanup cost commencement date and the PRP payment date. All of the inputs used in the calculations are shown.
3. Do not display results. Use this option if a data entry error is discovered.

CHOOSE OUTPUT OPTION 1,2 OR 3.

Option 1 and 2 will display CASHOUT's results in different levels of detail. Option 3 skips over the printing. CASHOUT then offers you the opportunity to do another present value calculation.

2. Changing Values in the User-Specified Mode

DO YOU WISH TO DO ANOTHER SUPERFUND CASHOUT CALCULATION?
(0=NO; 1=YES, USING STANDARD VALUES; 2=YES, USING OWN INPUTS)

2

This section outlines the procedures for changing variable values when variables 7 and 8 are user-specified. Type **2** to indicate that you wish to use nonstandard values. CASHOUT will then list all current user-specified values.

You can change any of the 8 variables and make as many changes as desired. If the previous value printed in the user-specified value is the desired value, press only the carriage return (or **enter** key) and CASHOUT will keep this value in memory. Note that in most cases where the previous run used standard values, the old values shown in the user-specified values are the standard values.

USER SPECIFIED VALUES

1. SUPERFUND SITE NAME =	TEST SITE		
2. RECURRING EXPENDITURES EVERY 10 YEARS	= \$	1000	1992 DOLLARS
3. ONE-TIME EXPENDITURE	= \$	0	1992 DOLLARS
4. ANNUAL EXPENSE FOR 999 YEARS (FOREVER)	= \$	20	1992 DOLLARS
5. PRP PAYMENT DATE	=	1,	1993
6. SUPERFUND CLEANUP COSTS COMMENCEMENT DATE	=	1,	1992
7. ANNUAL INFLATION RATE	=	2.0%	
8. DISCOUNT RATE	=	7.45%	
			(DOLLARS IN THOUSANDS)

Be sure to maintain the required relationships between variables. For example, the inflation rate cannot exceed the discount rate. CASHOUT checks for these types of errors after all changes have been made. See Chapter 2 for examples of the error messages that CASHOUT provides.

After you have entered all the information and CASHOUT has checked for errors, CASHOUT asks whether you desire a listing of the variables and their current values.

After all changes have been made (by either entering new values or by pressing the carriage return (or **enter** key) to use the former values), enter **0** (zero) to end the change session. CASHOUT then will bring you to the output option menu. After providing output, CASHOUT again offers you the opportunity to perform another present value calculation.

Appendix A

METHODOLOGY FOR COMPUTING THE PRESENT VALUE OF SUPERFUND CLEANUP COSTS

I. Introduction

This technical appendix explains the methodology used in the CASHOUT computer program to calculate the present value of cleanup costs for a given Superfund site. This calculation subsequently allows enforcement officials to "cash out" potentially responsible parties (PRPs) by having them pay their share of cleanup costs in one lump sum. This first section is an introduction to the methodology used in the present value calculation. Underlying assumptions are discussed in the second section. The third section presents and explains the mathematical formulae used in CASHOUT. The final section provides a sample CASHOUT calculation.

CASHOUT follows a two-step procedure. First, CASHOUT calculates each cost component as of the Superfund cleanup cost commencement date (CCCD). Second, CASHOUT discounts these costs forward or backward to the potentially responsible party's payment date (PRPPD) to give the present value of all cleanup costs due. CASHOUT includes the following cost components:

- Recurring expenditures (not annual costs)
- One-time expenditures
- Annual expenses

A. Present Value of Superfund Cleanup Costs as of the CCCD

The CASHOUT model requires users to identify the month and year when the Superfund site first incurs cleanup costs. This date is referred to as the "CCCD" or cleanup cost commencement date. CASHOUT assumes that all recurring expenditures and one-time expenses will commence on this date, and that annual expenses will begin six months later.²⁰

CASHOUT first determines all cost inputs in dollars of the "CCCD." These costs are separated into three categories mentioned earlier: Recurring expenditures; One-time expenditures; and Annual expenses. Each cost category is described separately below.

1. Recurring Expenditures

A Superfund site may require recurring capital outlays and expenditures to purchase and install pollution control or monitoring equipment. Note that these expenditures do not include annual expenses, which are treated separately.

2. One-Time Expenditures

A one-time expenditure occurs initially and is not repeated. Costs such as earth removal, site stabilization, or other one-time capital outlays are considered one-time expenditures.

3. Annual Expenses

Annual expenses are most typically costs associated with operation and maintenance of pollution control or monitoring equipment. These costs are assumed to occur annually, and increase every year due to inflation.

²⁰ This six-month lag is explained on page A-5 of this Appendix.

Annual expenses may occur for anywhere from 2 to infinite years.²¹

B. Present Value of Superfund Cleanup Costs as of the PRPPD

The CASHOUT model requires users to identify the month and year when the potentially responsible parties will make their lump-sum payments. The model refers to this date as the PRP payment date (PRPPD). CASHOUT takes the present value of costs calculated as of the CCCD (as described earlier) and converts them into present values as of the PRP payment date. This conversion is necessary because there is a "time value of money." In other words, assuming that the government can invest the funds at some positive rate of return, if a dollar of payment amount is received six months before it is spent on Superfund cleanup costs, that dollar can be invested in the interim. At the end of that six months, the expenditure can be made; and the return on the investment during the intervening period accrues as income to the government.

The technique used to compensate for this effect is called "discounting." Discounting converts the value of future cash flows into amounts that are equivalent in terms of constant-year dollars. For example, suppose the government wants to make a \$100 investment next year. If its investment alternatives today are such that it can earn a 10 percent annual return, the government could invest \$90.91 today and that amount would grow to \$100 in one year.²² Thus, \$90.91 is called the "present value," at 10 percent, of a \$100 cash flow one year in the future. Similarly, if \$82.65 were invested at 10 percent, it would grow to \$90.91 in one year, and to \$100 by the end of the second year. Thus, \$82.65 is the present value, at 10 percent, of a \$100 cash flow two years hence. The rate used in determining present values, 10 percent in this case, is called the "discount rate."

²¹ A one-year annual expense should be treated as a one-time cost.

²² Ten percent of \$90.91 = \$9.09, and \$90.01 + \$9.09 = \$100

The general formula for discounting is:

$$\text{Present Value (PV)} = \frac{F_j}{(1 + R)^j}$$

where:

- F_j = "Future value" cash flow expected in year j
- R = Annual discount rate in decimal form
(e.g., 0.10 for 10 percent)
- j = Number of years in the future in which the cash flow occurs; and $j=0$ is the year to which you are discounting.

Applying this technique to the CCCD cash flows converts them into their present-value equivalents as of the PRP payment date. The sum of these individual values represents the present value of the Superfund site's cleanup costs, which will be used to "cash out" all potentially responsible parties by making them pay their share of these costs in one lump sum.

II. Underlying Assumptions

Several important assumptions are made in calculating the present value of cleanup costs. Each of these assumptions is explained below.

A. Discounting Assumptions

The individual cost components in CASHOUT are discounted at a rate that reflects the rate of return the Federal government earns on its funds. The standard value used in CASHOUT is the five-year average of Federal Funds interest rates.²³ Chapter 3 of the manual describes how this value is calculated.

B. Application of the Inflation Rate

The inflation rate is used to convert all dollar inputs -- recurring expenditures, one-time expenditures, and annual expenses -- into dollars as of the CCCD year. Annual expenses and recurring costs are also inflated using the annual inflation rate.

C. Mid-Year Cash Flow Occurrence

CASHOUT estimates annual expenses as of the midpoint of each year. These mid-year cash flows begin six months after the capital investment and one-time nondepreciable expenditure are incurred. By assuming that these costs occur at mid-year, CASHOUT averages costs across the year.

D. Tax Issues

In calculating the present values of Superfund cleanup costs, CASHOUT is determining the amount of cleanup costs a PRP must pay. While the PRP can deduct the cleanup costs as an expense for tax purposes, that fact is irrelevant to the cashout calculation. The deductibility is relevant to the issue of whether the PRP is able to pay the proposed share, however.²⁴

²³ These rates can be found in Table 1.35, Federal Reserve Bulletin, 1987-1991.

²⁴ See: Supplement to the ABEL User's Manual: Superfund ABEL.

III. Derivation of Mathematical Formulae

This section describes the procedure for calculating the present value of Superfund site cleanup costs. The explanation is fairly detailed, including a majority of the mathematical formulae used in the CASHOUT model. Exhibit A-1 lists and defines all symbols used in this section.

Note that CASHOUT converts all rates (e.g., discount rate and inflation rate), which the user must enter as percentages, to a decimal format by dividing by 100. All of the rates used in the formulae below are expressed in decimal form.

Exhibit A-1
SYMBOL DEFINITIONS

AF	=	Annuity factor for annual expenses
ANTYVAL	=	Annuity value as of six months after the CCCD
AXDUR	=	Duration of annual expenses
RCOST	=	Recurring cost as entered
OCOST	=	One-time cost as entered
ACOST	=	Annual expense as entered
$RCOST_{CCCD}$	=	Recurring cost in CCCD dollars
$OCOST_{CCCD}$	=	One-time cost in CCCD dollars
$ACOST_{CCCD}$	=	Annual expense in CCCD dollars
i	=	Annual inflation rate
OM_1	=	First annual cash flow
OM_0	=	Initial annual cost, expressed in CCCD year-dollars
PVR_{CCCD}	=	Present value of recurring costs as of the CCCD
PVO_{CCCD}	=	Present value of one-time costs as of the CCCD
PVA_{CCCD}	=	Present value of annual expense as of the CCCD
PV_{PRPPD}	=	Present value of costs as of the PRP payment date
r	=	Annual discount rate
a	=	Discount rate for the annual expense annuity
r_m	=	Monthly discount rate
u	=	Number of years between recurring costs
TIMEDIF	=	Fractional value in years of the time period between the CCCD year and the cost's dollar-year

A. Present Value of Superfund Cleanup Costs as of the CCCD

This section explains the calculations performed by CASHOUT to derive the present value of Superfund cleanup costs as of the cleanup cost commencement date. These costs are categorized into three groups: Recurring expenditures, One-Time expenditures, and Annual expenses. Subsections 1, 2 and 3 below explain each of these.

Before any costs are used in the formulae, CASHOUT first converts the costs into dollars of the year or the CCCD. The model performs this adjustment using the dollar-year entered with the cost figure as follows:²⁵

$$(1) \quad \text{COST}_{\text{CCCD}} = \text{COST} * (1+i)^{\text{TIMEDIF}}$$

where:

$\text{COST}_{\text{CCCD}}$	=	Cost expressed in CCCD year dollars
COST	=	Cost as entered
i	=	Annual inflation rate
TIMEDIF	=	Time period in years between the CCCD year and the cost's dollar-year

Each of the values discussed below is expressed in cleanup cost commencement date year dollars. Assume that CASHOUT has already performed the appropriate inflation calculations.

1. Recurring Expenditures

Recurring expenditures are the total cost of pollution control equipment of limited useful life and other non-annual recurring costs.

²⁵ Note that the PRP payment date will always be equal to or later than the dollar-year of costs.

In order to take into account future replacement cycles of recurring expenditures, the present value as of the cleanup cost commencement date for all lives must be calculated. This calculation is accomplished using the following equation:²⁶

$$(2) \quad PVR_{CCCD} = \frac{RCOST_{CCCD}}{1 - \left(\frac{1+i}{1+r} \right)^u}$$

where:

PVR_{CCCD}	=	Present value of recurring costs as of the CCCD
$RCOST_{CCCD}$	=	Recurring costs expressed in CCCD dollars
i	=	Annual inflation rate
r	=	Annual discount rate
u	=	Number of years between recurring costs

2. One-Time Expenditures

The one-time expenditure occurs initially. Because it does not recur, CASHOUT simply inflates the expenditure to the cleanup cost commencement date.

²⁶ Note that this formula is the sum of the following geometric series:

$$RCOST_{CCCD} + (RCOST_{CCCD} * R) + (RCOST_{CCCD} * R^2) + \dots$$

$$where: \quad R = \left(\frac{1+i}{1+r} \right)^u$$

This series represents the discounted sum of all recurring expenditures for an infinite number of lives.

3. Annual Expenses

The initial annual cost, expressed in CCCD-year dollars, is denoted by OM_0 . Annual costs in CASHOUT increase at the rate of inflation. Annual costs are assumed to occur at mid-year. The first annual cash flow (OM_1) occurs in the middle of the first year, six months after the initial recurring expenditure. The inflation rate is thus applied for half a year:

$$(3) \quad OM_1 = OM_0 * (1 + i)^{1/2}$$

where:

OM_1	=	First annual cash flow
OM_0	=	Initial annual cost, expressed in CCCD year-dollars
i	=	Annual inflation rate

Because the annual expense occurs yearly, CASHOUT calculates the annuity value of the annual expense as of the CCCD and adds it to the first annual cash flow to obtain the present value of all annual expense cash flows.²⁷ This calculation will involve four steps: (a) calculating the discount rate for the annual expense annuity; (b) calculating the annuity factor; (c) multiplying the first annual cash flow by the derived annuity factor; and (d) discounting the sum of the first annual cash flow and the following annuities back to the cleanup cost commencement date (six months earlier).

²⁷ An annuity is defined as a fixed sum paid each year for a specified number of years.

a. Discount Rate for Annual Expense Annuity

The discount rate for the annual expense annuity is calculated as follows:

$$(4) \quad a = \frac{(1 + r)}{(1 + i)} - 1$$

where:

a	=	Discount rate for the annual expense annuity
r	=	Annual discount rate
i	=	Annual inflation rate

b. Annuity Factor for Annual Expenses

Using the annuity discount rate, the annual expense annuity factor can then be calculated:

$$(5) \quad AF = \frac{1}{a} - \left[\frac{1}{a * (1 + a)^{AXDUR} - 1} \right]$$

where:

AF	=	Annuity factor for annual expenses
a	=	Discount rate for the annual expense annuity
AXDUR	=	Duration of annual expenses in years ²⁸

²⁸ If annual expenses are expected to last forever, a finite number (999) is used in place of infinity; the results are identical, using CASHOUT's rounding provisions.

c. Annuity Value as of Cleanup Cost Commencement Date

The annuity value as of six months after the cleanup cost commencement date is produced by multiplying the first annual expense cash flow by the annuity factor:²⁹

$$(6) \quad \text{ANTYVAL} = \text{OM}_1 * \text{AF}$$

where:

ANTYVAL	=	Annuity value as of six months after the CCCD
OM ₁	=	First annual cash flow
AF	=	Annuity factor for annual expenses

Because the present values of the first annual cash flow and the annual expense annuity are stated as of six months after the cleanup cost commencement date, they must be discounted back six months:

$$(7) \quad \text{PVA}_{\text{CCCD}} = \frac{(\text{OM}_1 + \text{ANTYVAL})}{(1 + r)^{1/2}}$$

where:

PVA _{CCCD}	=	Present value of costs as of the CCCD
OM ₁	=	First annual cash flow
ANTYVAL	=	Annuity value as of six months after the CCCD
r	=	Annual discount rate

²⁹ The six-month lag period is due to the mid year convention explained in the Mid-Year Cash Flow Occurrence section on page A-4 of this appendix.

All costs have now been valued as of the Superfund cleanup cost commencement date, and can be added together to give the present value of all costs as of the CCCD:

$$(8) \quad PV_{CCCD} = PVR_{CCCD} + PVO_{CCCD} + PVA_{CCCD}$$

B. Present Value of Superfund Cleanup Costs as of the PRPPD

Once CASHOUT has determined the present value of all costs as of the Superfund cleanup cost commencement date, it discounts these costs either forward or backward to the PRP payment period. Because of the time differential between the date the government receives the PRP payment and the date the government first incurs cleanup costs, the government can earn income on these funds when they are received before cleanup commences. When the government must wait for the PRP payment until after cleanup begins, it must be reimbursed for the lost interest on the funds spent. To account for this interest earned or due during this period, CASHOUT applies the general discounting formula to calculate the value of each cost component as of the PRP payment date:

$$(9) \quad PV_{PRPPD} = \frac{PV_{CCCD}}{(1 + r_m)^{MODIF}}$$

where:

PV_{PRPPD}	=	Present value of costs as of the PRP payment date
PV_{CCCD}	=	Present value of costs as of the CCCD
r_m	=	Monthly discount rate
MODIF	=	Number of months between the PRPPD and the CCCD ³⁰

³⁰ Note that this number can be either positive or negative, depending upon the dates, and the formula will still work.

CASHOUT uses this equation (9) to calculate the present value of each cost component as of the PRP payment date, and then sums the present values of all costs to produce the present value of all Superfund site cleanup costs as of the PRP payment date.

IV. Sample CASHOUT Calculation

This section illustrates CASHOUT's calculation of the present value of cleanup costs for a hypothetical Superfund site. The inputs are as follows:

1)	Superfund Site Name	TEST SITE
2)	Recurring Expenditures	\$1,000,000 1992 dollars, every 10 years
3)	One-Time Expenditure	0
4)	Annual Expense	\$25,000 1992 dollars, for 10 years
5)	PRP Payment Date	January 1993
6)	Superfund Cleanup Cost Commencement	January 1992
7)	Annual Inflation Rate	3.2 percent
8)	Discount Rate	7.67 percent

The output from this run, using output option 2, is shown in Exhibit A-2.

Exhibit A-2

SAMPLE CASHOUT CALCULATION - OUTPUT OPTION 2

TEST SITE

CASHOUT JULY 1, 1992

PRESENT VALUE OF CLEANUP COSTS AS OF COST COMMENCEMENT DATE:

RECURRING EXPENDITURES EVERY 10 YEARS		\$	2894
ONE-TIME EXPENDITURE		\$	0
ANNUAL EXPENSE FOR 10 YEARS	\$	204	
		=====	
TOTAL AS OF 1, 1992	\$	3097	

PRESENT VALUE OF CLEANUP COSTS AS OF PRP PAYMENT DATE:

RECURRING EXPENDITURES EVERY 10 YEARS		\$	3116
ONE-TIME EXPENDITURE		\$	0
ANNUAL EXPENSE FOR 10 YEARS	\$	219	
		=====	
TOTAL AS OF 1, 1993	\$	3335	

(DOLLARS IN THOUSANDS)

PLEASE PRESS CARRIAGE RETURN FOR MORE OUTPUT

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A. Present Value of Superfund Cleanup Costs as of the CCCD

The initial step in calculating the present value of Superfund cleanup costs as of the PRP date is to calculate them as of the CCCD. First, CASHOUT inflates or deflates the dollar input amounts; i.e., recurring expenditures, one-time expenditures and annual expenses, to the year of the CCCD using the 3.2 percent inflation rate. Because the inputs are already in 1992 dollars, the first step is unnecessary in this case. CASHOUT then calculates the present value of all future costs, accounting for recurring expenditures every 10 years and annual expenses lasting for 10 years. Note that since the one-time expenditure does not recur, CASHOUT does require any further calculations (beyond inflating or deflating the dollar amount to the CCCD year) to calculate its present value as of the CCCD.

CASHOUT then calculates the present value of the recurring expenditure and all future replacement cycles, using equation (2) from the last section.

$$\begin{aligned} \text{PVR}_{\text{CCCD}} &= \frac{1,000,000}{1 - \left(\frac{1.032}{1.0767} \right)^{10}} \\ &= 2,893,601 \\ &= 2,894 \text{ in thousands} \end{aligned}$$

CASHOUT also calculates the present value of annual expenses, accounting for all future expenditures. Because annual expenses occur yearly, CASHOUT calculates the annuity value of the annual expense as of the CCCD and adds it to the first annual cash flow to obtain the present value of all annual expense cash flows. To perform these calculations, we use equations (3), (4), (5), (6), and (7) outlined on pages A-7 through A-10.

$$\begin{aligned} OM_1 &= 25,000 * (1.032)^{1/2} \\ &= 25,397 \end{aligned}$$

$$\begin{aligned}
 a &= \frac{1.0767}{1.032} - 1 \\
 &= 0.04331
 \end{aligned}$$

$$\begin{aligned}
 AF &= \frac{1}{0.04331} - \left[\frac{1}{0.04331 * (1.04331)^9} \right] \\
 &= \frac{1}{0.4331} - \frac{1}{0.06344} \\
 &= 23.0872 - 15.7629 \\
 &= 7.3243
 \end{aligned}$$

$$\begin{aligned}
 ANTYVAL &= 25,397 * 7.3243 \\
 &= 186,016
 \end{aligned}$$

$$\begin{aligned}
 PVA_{CCCD} &= \frac{(25,397 + 186,016)}{(1.0767)^{1/2}} \\
 &= 203.743 \\
 &= 204 \text{ in thousands}
 \end{aligned}$$

The Output Option 2 Table shows the present value of the annual expense and all future annual costs as of the CCCD.

B. Present Value of Superfund Cleanup Costs as of the PRPPD

The next step is to calculate the present values of each cost input as of the PRP payment date. This calculation takes into account the "time value of money" for the time differential between the date government receives the PRP payment and the date the government first incurs cleanup costs. CASHOUT applies the general discounting formula, equation (8), to calculate the present value of each cost component as of the PRP payment date using the monthly discount rate:³¹

Recurring Expenditure:

$$\begin{aligned} \text{PVR}_{\text{PRPPD}} &= \frac{\$2,894}{(1 + 0.006177)^{-12}} \\ &= \$3,116 \end{aligned}$$

³¹ Note the monthly discount rate is calculated using the following equation:

$$r_m = (1 + r)^{(1/12)} - 1$$

where: r_m = monthly discount rate
 r = annual discount rate

So, in the Test Site example:

$$\begin{aligned} r_m &= (1.0767)^{1/12} - 1 \\ &= 0.006177 \end{aligned}$$

One-time Expenditure:

$$\begin{aligned} \text{PVO}_{\text{PRPPD}} &= \frac{0}{(1 + 0.006177)^{-12}} \\ &= \$0 \end{aligned}$$

Annual Expense:

$$\text{PVA}_{\text{PRPPD}} = \frac{\$204}{(1 + 0.006177)^{-12}} = \$219$$

CASHOUT's total present value of all site cleanup costs and future expenditures as of the PRP payment date is then:

Total Present Value:

$$\text{PV}_{\text{PRPPD}} = \$3,116 + \$0 + \$219 = \$3,335$$